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Committee of Experts on the Transport of Dangerous Goods and on the Globally Harmonized System of Classification and Labelling of Chemicals

Sub-Committee of Experts on the Transport of Dangerous Goods

Forty-seventh session
Geneva, 22 – 26 June 2015
Item 2 (c) of the provisional agenda
Explosives and related matters:
Review of tests in parts I and II of the Manual of Tests and Criteria

Test results relating to the Koenen test

Transmitted by the expert from Germany[1]

1. Reference is made to section 11, test series 1, type 1 (c), section 12, test series 2, type 2 (b), section 8, test series 8, type 8 (c), and section 25, test series E, type E.1.

2. During the last meeting of the IGUS[2] EOS[3] Working Group the quality of the steel tubes for the Koenen Test was discussed.

3. Tubes, which are used for the Koenen Test are deep drawn from sheet steel confirming to specification DC04 (EN 10027-1), or equivalent A620 (AISI/SAE/ASTM), or equivalent SPCEN (JIS G 3141).

3. Based on these specifications the content of manganese has to be less than 0.4 %.

4. According to information of the manufacturer in the old days the manganese content of the sheet steel was 0.32 %, now the content is 0.22 % or less because the former specification is no longer available. Nevertheless, the sheet steel is inside the specification of the standards!

5. For quality control of the steel tubes, 1% of the tubes from each production lot shall be subjected to quality control and the following data shall be verified

[1] In accordance with the programme of work of the Sub-Committee for 2015–2016 approved by the Committee at its seventh session (see ST/SG/AC.10/C.3/92, paragraph 95 and ST/SG/AC.10/42, para. 15).
[2] IGUS is the International Group of Experts on the Explosion Risks of Unstable Substances
[3] EOS is the Energetic and Oxidising Substances Working Group of IGUS

Please recycle

(a) The mass of the tubes shall be 26.5 ± 1.5 g, tubes to be used in one test sequenceshall not differ in mass by more than 1 g;

(b) The length of the tubes shall be 75 ± 0.5 mm;

(c) The wall thickness of the tubes measured 20 mm from the bottom of the tube shall be 0.5 ± 0.05 mm; and

(d) The bursting pressure as determined by quasi-static load through an incompressible fluid shall be 30 MPa ± 3 MPa.

6. The bursting pressure of steel tubes which are deep drawn from sheet steel with a manganese content of 0.22 % is between 25.2 MPa and 25.9 MPa, respectively. These steel tubes are formerly not inside the quality which is required by the UN Test Manual.

7. Based on the situation, that it was not possible for the manufacturer to get the former specification of sheet steel the IGUS EOS Working Group has asked companies and competent authorities to carry out tests on selected substances using former steel tubes (bursting pressure 30 MPa ± 3 MPa) on the one hand and using the new steel tubes (bursting pressure between 25.2 MPa and 25.9 MPa) on the other hand.

8. The IGUS EOS group wants to present the results as given below in the annex.

9. Based on the test results the observed effects on the steel tubes with a bursting pressure between 25.2 MPa and 25.9 MPa are comparable to the effects as observed before using the former steel tube quality.

10. The IGUS EOS Working Group recommends changing the steel tube bursting pressure criteria in terms of quality control to 28 MPa ± 4 MPa.

11. Consequently, the letter (d) in section 11 (no 11.5.1.2.1), section 12 (no 12.5.1.2.1), section 8 (18.6.1.2.1) and section 25 (no 25.4.1.2.1) might be amended as follows:

(d) The bursting pressure as determined by quasi-static load through an incompressible fluid shall be 28 MPa ± 4 MPa.

Annex

Test results

tert-Butylperoxy-2-ethylhexanoate

Old tubes	**New tubes**
Company: United Initiators	
 2.0 mm	 2.0 mm
Company: Akzo Nobel	

(1)

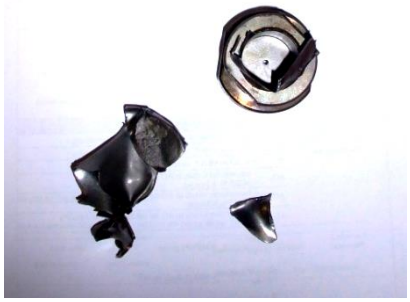
2.0 mm

(2)

2.0 mm

2.0 mm

	Old tubes			**New tubes**	
	Akzo Nobel (1)	Akzo Nobel (2)	United Initiators	Akzo Nobel	United Initiators
Mass of the tube [g]	27.4	27.2	26.7	26.7	26.7
Sample mass [g]	24.3	24.3	25.8	24.3	25.8
Orifice diameter [mm]	2.0	2.0	2.0	2.0	2.0
Result	no explosion	Explosion	Explosion	Explosion	Explosion
Type of fragmentation	B	F	F	F	F
t_1 [s]	24	20	23	23	23
t_2 [s]	3	2	5	2	4

tert-Butylperoxybenzoate	
Old tubes	**New tubes**
Company: Akzo Nobel	
 2.0 mm	 2.0 mm
Company: United Initiators	
 2.0 mm	 2.0 mm

	New		**Old**	
	Akzo Nobel New	United Initiator New	Akzo Nobel Old	United Initiator Old
Mass of the tube [g]	26.4	26.3	27.0	26.4
Sample mass [g]	28.3	29.9	28.3	29.9
Orifice diameter [mm]	2.0	2.0	2.0	2.0
Result	Explosion	Explosion	Explosion	Explosion
Type of fragmentation	F	F	F	F
t_1 [s]	24	33	28	34
t_2 [s]	2	5	2	4

Di-tert-butyl peroxide	
Old tubes	**New tubes**
Company: United Initiators	
 1 mm	 1 mm
Company: Akzo Nobel	
 1 mm	 1 mm

	New		**Old**	
	Akzo Nobel New	United Initiator New	Akzo Nobel Old	United Initiator Old
Mass of the tube [g]	26.4	26.6	27.2	26.0
Sample mass [g]	21.6	22.3	21.6	22.3
Orifice diameter [mm]	1.0	1.0	1.0	1.0
Result	No explosion	No explosion	No explosion	No explosion
Type of fragmentation	0	0	0	0
t_1 [s]	15	17	14	20
t_2 [s]	21	36	20	26

4-Amino-3-hydrazino-1,2,4-triazole			
Old tubes		**New tubes**	
BAM		BAM	
 3 mm		 3 mm	 3 mm
Mass of the tube [g]	25.8	26.5	26.2
Sample mass [g]	18.6	18.2	18.2
Orifice diameter [mm]	3.0	3.0	3.0
Result	Explosion	Explosion	Explosion
Type of fragmentation	F	F	F
t_1 [s]	7	6	7
t_2 [s]	3	3	0